What is claimed is:

1.   In a speech processing system including a signal processor arrangement that analyzes an
input speech signal and, in response, generates the short-term characteristics of the input speech
signal and a target vector, a method of analyzing the input speech signal comprising:

    generating from the target vector and the short term characteristics, a plurality of
sequences of variable-amplitude pulses, each of the sequences having a different average
amplitude value; and

    outputting a signal corresponding to a sequence of equal-amplitude pulses which,
according to an error criterion, represents the target vector.

2.   A system according to claim 1, wherein the target vector is matched using a perceptual
weighting criterion.

3.   A speech processing system including a signal processor arrangement that analyzes an
input speech signal and, in response, generates the short-term characteristics of the input speech
signal and a target vector, comprising:

    means for generating from the target vector and the short term characteristics, a plurality
of sequences of variable-amplitude pulses, each of the sequences having a different average
amplitude value; and

    means for outputting a signal corresponding to a sequence of equal-amplitude pulses
which, according to an error criterion, represents the target vector.

4.   A system according to claim 3, wherein the target vector is matched using aperceptual
weighting criterion.

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1   5.   A speech processing system including a signal processor arrangement that analyzes an

2   input speech signal and, in response, generates the short-term characteristics of the input speech

3   signal and a target vector, comprising:

4   an analyzer adapted to receive the target vector and the short term characteristics and to

5   generate a plurality of sequences of variable-amplitude pulses, each of said sequences having a

6   different average amplitude value;

7   the analyzer being further adapted to output a signal corresponding to a sequence of

8   equal-amplitude pulses which, according to an error criterion, represents the target vector.

1   6.   A system according to claim 5, wherein the target vector is matched using a perceptual

2   weighting criterion.

7.   A speech processing system including a signal processor arrangement that analyzes an

input speech signal and, in response, generates the short-term characteristics of the input speech

signal and a target vector, comprising:

        a multi-pulse analyzer adapted to receive the target vector and the short term

characteristics and to generate a plurality of sequences of variable-amplitude, variable-sign and

variably-spaced pulses, each of said sequences having a different average amplitude value, each

of said pulses within each sequence having variable amplitudes and variable signs;

        the multi-pulse analyzer being further adapted to output a signal corresponding to a

9   sequence of equal-amplitude, variable-sign, variably-spaced pulses which, according to a

10 maximum likelihood criterion, most closely represents the target vector.

1   8.   A system according to claim 7, wherein the target vector is matched using a perceptual

2   weighting criterion.

1   9.   A system according to claim 7, wherein the pulse amplitude variations are based on at

2   least one of: the exponential function; a linear function; the short-term characteristics of the

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3   input speech signal; the long-term characteristics of the input speech signal; and the excitation

4   signal from previous frames.

1   10.   A speech processing system comprising:

2   a short-term analyzer that analyzes an input speech signal, and in response to said input

3   speech signal, generates the short-term characteristics of the input speech signal;

4   a target vector generator for generating data including a target vector from at least said

5   input speech signal, and optionally, said short-term characteristics; and

6   a multi-pulse analyzer adapted to receive the target vector and the short term

7   characteristics and to generate a plurality of sequences of variable amplitude, variable sign,

8   variably-spaced pulses, each of said sequences having a different average amplitude value, each

9   of said pulses within each sequence having variable amplitudes and variable signs, said multi-

10   pulse analyzer for outputting a signal corresponding to the sequence of equal amplitude, variable

11   sign, variably spaced pulses which, according to a maximum likelihood criterion, most closely

12   represents said target vector.

1   11.   A system according to claim 10, wherein the target vector is matched using a perceptual

2   weighting criterion; and

3   wherein the pulse amplitude variations are based on at least one of: the exponential

4   function; a linear function; the short-term characteristics of the input speech signal; the long-term

5   characteristics of the input speech signal; and the excitation signal from previous frames.

1   12.   A speech processing system comprising:

2   a short-term analyzer that analyzes an input speech signal, and in response to said input

3   speech signal, generates the short-term characteristics of the input speech signal;

4   a target vector generator for generating a target vector from at least said input speech

5   signal, and optionally, said short-term characteristics; and

6   a multi-pulse analyzer connected to an output line of said target vector generator and an

7   output line of said short term analyzer, wherein said multi-pulse analyzer generates a plurality of

8   sequences of variable amplitude, variable sign, variably spaced pulses, each of said sequences

9   having a different average amplitude value, each of said pulses within each sequence having

10   variable amplitudes and variable signs, said multi-pulse analyzer for outputting a signal

11   corresponding to the sequence of variable amplitude, variable sign, variably spaced pulses which,

12   according to the maximum likelihood criterion, most closely represents said target vector.

1   13.   A system according to claim 12, wherein the target vector is matched using a perceptual

2   weighting criterion.

14.   A system according to claim 13, wherein the pulse amplitude variations are based on at

least one of: the exponential function; a linear function; the short-term characteristics of the

input speech signal; the long-term characteristics of the input speech signal; and the excitation

signal from previous frames.

15.   A speech processing system comprising:

       a short-term analyzer that analyzes an input speech signal, and in response to said input

speech signal, generates the short-term characteristics of the input speech signal;

       a target vector generator for generating a target vector from at least said input speech

5   signal, and optionally, said short-term characteristics; and

6   a multi-pulse analyzer connected to an output line of said target vector generator and an

7   output line of said short term analyzer, wherein said multi-pulse analyzer generates a plurality of

8   sequences of variable amplitude, variable sign, variably spaced pulses, each of said sequences

9   having a different average amplitude value, each of said pulses within each sequence having

10   variable amplitudes and variable signs, said multi-pulse analyzer for outputting a signal

11   corresponding to the sequence of variable amplitude, variable sign, variably spaced pulses which,

12   according to the maximum likelihood criterion, most closely represents said target vector, and

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13   one or more pulse sequence modifiers, each having as input at least a sequence of equal

14   amplitude, variable sign, variably spaced pulses, wherein each said pulse sequence modifier

15   modifies its input sequence and produces as output a sequence of variable amplitude, variable

16   sign, variably spaced pulses.

1   16.   A system according to claim 15 wherein the pulse sequence modification function is

2   based on at least one of: the exponential function; a linear function; the short-term

3   characteristics of the input speech signal; the long-term characteristics of the input speech signal;

4   and the excitation signal from previous frames.

1   17.   A speech processing system comprising:

2   a short-term analyzer that analyzes an input speech signal, and in response to said input

3   speech signal, generates the short-term characteristics of the input speech signal;

4   a long-term analyzer that analyzes an input speech signal, and in response to said input

5   speech signal, generates the long-term characteristics of the input speech signal;

6   a target vector generator for generating a target vector from at least said input speech

7   signal, and optionally, said short-term characteristics, and optionally, said long-term

8   characteristics; and

9   a pulse-train sequence analyzer connected to at least an output line of said target vector

10   generator and an output line of said short term analyzer, wherein said pulse-train sequence

11   analyzer generates a plurality of sequences of variable amplitude, variable sign, variably spaced

12   pulse trains, each of said sequences having a different average amplitude value, each of said

13   pulse trains within each sequence having variable amplitudes and variable signs, said pulse-train

14   sequence analyzer for outputting a signal corresponding to the sequence of equal amplitude,

15   variable sign, variably spaced pulse trains which, according to the maximum likelihood criterion,

16   most closely represents said target vector.

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1 18.   A system according to claim 17, wherein the pulse amplitude variations are based on at

2 least one of: the exponential function; a linear function; the short-term characteristics of the

3 input speech signal; the long-term characteristics of the input speech signal; and the excitation

4 signal from previous frames.

1 19.   A system according to claim 18, wherein the target vector is matched using a perceptual

2 weighting criterion.

1 20.   A speech processing system comprising:

2   a short-term analyzer that analyzes an input speech signal, and in response to said input

3 speech signal, generates the short-term characteristics of the input speech signal;

4   a long-term analyzer that analyzes an input speech signal, and in response to said input

5 speech signal, generates the long-term characteristics of the input speech signal;

6   a target vector generator for generating a target vector from at least said input speech

7 signal, and optionally, said short-term characteristics, and optionally, said long-term

8 characteristics; and

9   a pulse-train sequence analyzer connected to at least an output line of said target vector

10 generator and an output line of said short term analyzer, wherein said pulse-train sequence

11 analyzer generates a plurality of sequences of variable amplitude, variable sign, variably spaced

12 pulse trains, each of said sequences having a different average amplitude value, each of said

13 pulse trains within each sequence having variable amplitudes and variable signs, said pulse-train

14 sequence analyzer for outputting a signal corresponding to the sequence of variable amplitude,

15 variable sign, variably spaced pulse trains which, according to the maximum likelihood criterion,

16 most closely represents said target vector.

1 21.   A system according to claim 20, wherein the target vector is matched using a perceptual

2 weighting criterion.

1 22.   A system according to claim 20, wherein the pulse amplitude variations are based on at
2 least one of: the exponential function; a linear function; the short-term characteristics of the
3 input speech signal; the long-term characteristics of the input speech signal; and the excitation
4 signal from previous frames.

1 23.   A system according to claim 21, wherein the pulse amplitude variations are based on at
2 least one of: the exponential function; a linear function; the short-term characteristics of the
3 input speech signal; the long-term characteristics of the input speech signal; and the excitation
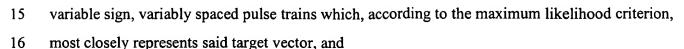4 signal from previous frames.

1 24.   A system according to claim 21 wherein the pulse amplitude variations are based on at
2 least one of: the exponential function; a linear function; and characteristics of the input speech
3 signal.

1 25.   A speech processing system comprising:
2   a short-term analyzer that analyzes an input speech signal, and in response to said input
3 speech signal, generates the short-term characteristics of the input speech signal;
4   a long-term analyzer that analyzes an input speech signal, and in response to said input
5 speech signal, generates the long-term characteristics of the input speech signal;
6   a target vector generator for generating a target vector from at least said input speech
7 signal, and optionally, said short-term characteristics, and optionally, said long-term
8 characteristics; and
9   a pulse-train sequence analyzer connected to at least an output line of said target vector
10 generator and an output line of said short term analyzer, wherein said pulse-train sequence
11 analyzer generates a plurality of sequences of variable amplitude, variable sign, variably spaced
12 pulse trains, each of said sequences having a different average amplitude value, each of said
13 pulse trains within each sequence having variable amplitudes and variable signs, said pulse-train
14 sequence analyzer for outputting a signal corresponding to the sequence of variable amplitude,

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15   variable sign, variably spaced pulse trains which, according to the maximum likelihood criterion,

16   most closely represents said target vector, and

17   one or more pulse-train sequence modifiers, each having as input at least a sequence of

18   equal amplitude, variable sign, variably spaced pulse trains, wherein each said pulse sequence

19   modifier modifies its input sequence and produces as output a sequence of variable amplitude,

20   variable sign, variably spaced pulse trains.

1   26.   A system according to claim 25, wherein the target vector is matched using a perceptual

2   weighting criterion.

1   27.   A system according to claim 25, wherein the pulse amplitude variations are based on at

2   least one of: the exponential function; a linear function; the short-term characteristics of the

3   input speech signal; the long-term characteristics of the input speech signal; and the excitation

4   signal from previous frames.

1   28.   A system according to claim 25, wherein the pulse-train sequence modification function

2   is based on the exponential function.

1   29.   A system according to claim 25, wherein the pulse-train sequence modification function

2   is based on a linear function.

1   30.   A system according to claim 25, wherein the pulse-train sequence modification function

2   is based on the short-term characteristics of the input speech signal.

1   31.   A system according to claim 25, wherein the pulse-train sequence modification is based

2   on the long-term characteristics of the input speech signal.

1   32.   A system according to claim 25, wherein the pulse-train sequence modification function

2   is based on the excitation signal from previous frames.